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IS 2782 (1964): Primary nickel [MTD 5: Ferro Alloys]

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SPECIFICATION FOR PRIMARY NICKEL

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August 1964

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SPECIFICATION FOR PRIMARY NICKEL

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Indian Standard

SPECIFICATION FOR PRIMARY NICKEL

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 20 July 1964, after the draft finalized by the Ferro Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard covers two grades of primary nickel, that is, nickel made from ore or matte, or similar raw materials by refining processes, and not produced from re-melted metal. These grades of nickel are used for the manufacture of nickel anodes and ferrous and non-ferrous alloys.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2 - 1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers minimum requirements for two grades of primary nickel commonly used for nickel anodes and in the ferrous and non-ferrous industry.

2. GRADES

2.1 Primary nickel shall be of two grades, namely, Grade 1 and Grade 2.

3. SUPPLY OF MATERIAL

3.1 General requirements relating to the supply of primary nickel shall be as laid down in IS : 1387-1959†.

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*Rules for rounding off numerical values (*revised*).

†General requirements for the supply of metals and metal products.

4. FORM AND SIZE

4.1 The form of material and sizes shall be as agreed to between the supplier and the purchaser.

5. CHEMICAL COMPOSITION

5.1 The chemical composition of the material, when determined in accordance with *IS : 2766- shall be as given in Table 1.

TABLE 1 CHEMICAL COMPOSITION OF PRIMARY NICKEL

	GRADE 1 percent	GRADE 2 percent
Nickel (including cobalt), *Min*	99·90	99·50
Sulphur, *Max*	0·005	0·02
Carbon, *Max*	0·03	0·10
Iron, *Max*	0·03	0·20
Copper, *Max*	0·03	0·05
Antimony, *Max*	0·001	0·005
Bismuth, *Max*	0·001	0·005
Lead, *Max*	0·003	0·005
Total other impurities, *Max*	—	0·10

NOTE — While it is permissible to include cobalt, the percentage of pure nickel shall be not less than 99·60 in Grade 1 metal and 99·00 in Grade 2 metal.

6. SAMPLING AND ASSESSMENT OF THE GRADE

6.1 Gross Samples (When the Ingots/Packages/Drums Carry the Melt or Cast Number) — The quantity of nickel of one grade manufactured at one place from the same melt or cast and offered for inspection at one time shall be considered as a lot. A lot may consist of the whole or part of the quantity of nickel ordered for. From each lot, drillings/shots or pellets/powder weighing about 500 g shall be collected as detailed in **6.2.2.1** to **6.2.2.4** to constitute a gross sample.

6.2 Gross Samples (When the Material does not Carry the Melt or Cast Number)

6.2.1 The quantity of nickel of one grade manufactured at the same place and offered for inspection at one time shall be considered as a lot. A lot may consist of the whole or part of the quantity of nickel ordered for.

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*Methods of chemical analysis of primary nickel. This standard is under preparation. Until this is published, the analysis may be carried out by methods as agreed to between the supplier and the purchaser.

AMENDMENT NO. 1 MAY 1969
TO
IS : 2782-1964 SPECIFICATION FOR PRIMARY NICKEL

Alteration

(*Page* 5, *clause* **6.2.2.2**) — Substitute the following for the existing clause:

'**6.2.2.2** *Shots or pellets or rondelles or briquettes and cut-up cathodes* — When the nickel is supplied in the form of shots or pellets or rondelles or briquettes and cut-up cathodes, a minimum of two cases or drums shall be selected at random for each sub-lot. From each of the drums so selected, small quantities of the material shall be collected from the top, centre and bottom portions so as to make the required weight of the gross sample. For the purpose of obtaining the sawings from the pellets, a mechanical saw of 1·00 mm pitch shall be used. The saw-blade shall be previously cleaned with emery cloth ether and shall be used to cut a few odd pellets to remove any residable contamination lodged in the teeth. Actual sample sawings shall be collected in a clean receiver. Fundamental precautions, such as the handling of pellets with forceps, inspection of the saw after cutting each sample to ensure that there are no teeth missing, etc, shall be scrupulously followed .'

(SMDC 8)

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6.2.2 For the purpose of sampling, the quantity of nickel in a lot shall be considered as divided into the number of sub-lots of approximately equal weight as specified in Table 2.

From each sub-lot, drillings/shots or pellets/powder weighing about 500 g shall be collected as detailed in **6.2.2.1** to **6.2.2.4** to constitute a gross sample. Thus there will be as many gross samples as the number of sub-lots into which a lot has been divided.

TABLE 2 NUMBER OF SUB-LOTS INTO WHICH A LOT IS TO BE DIVIDED

WEIGHT OF A LOT (IN kg)	NUMBER OF SUB-LOTS
Up to 2 500	2
2 501 ,, 5 000	3
5 001 ,, 8 000	4
8 001 ,, 10 000	5

6.2.2.1 *Electrolytic cathodes* — When nickel is supplied in the form of cathode plates, complete or cut-up, approximately 5 percent of the cathodes in the sub-lot (subject to a minimum of 3 cathodes) shall be selected at random. Each of the sample cathodes so selected shall be drilled and the drillings obtained shall be thoroughly mixed so as to obtain a gross sample of 500 g for each of the sub-lots.

6.2.2.2 *Shots or pellets* — When the nickel is supplied in the form of shots or pellets, a minimum of two cases or drums shall be selected at random for each sub-lot. From each of the drums so selected, small quantities of the material shall be collected from the top, centre and bottom portions so as to make the required weight of the gross sample. For the purpose of obtaining the sawings from the pellets, a mechanical saw of 1·00 mm pitch shall be used. The saw-blade shall be previously cleaned with emery cloth ether and shall be used to cut a few odd pellets to remove any residable contamination lodged in the teeth. Actual sample sawings shall be collected in a clean receiver. Fundamental precautions, such as the handling of pellets with forceps, inspection of the saw after cutting each sample to ensure that there are no teeth missing, etc, shall be scrupulously followed.

6.2.2.3 *Ingots* — When the nickel is supplied in the form of ingots, the weight of the gross sample shall be made up by drilling sufficient number of ingots selected at random through their total thickness. The ingots may be drilled from both directions — top and bottom, if necessary. Drillings shall be so regulated as to avoid excess heat and consequent oxidation of the sample obtained. No lubricant shall be used while drilling.

6.2.2.4 *Powder* — When the nickel is supplied in the form of powder, one drum for every five or part thereof (subject to a minimum of 5 drums) shall be chosen for drawing the sample. From each of the drums so chosen, adequate quantity of the material shall be drawn with the help of a 12-mm diameter probe so as to obtain a gross sample of 500 g for each sub-lot.

6.3 Laboratory Sample — Each of the gross samples obtained as in **6.1** or **6.2.1** shall be mixed well and reduced by the method of coning and quartering, to weight about 100 g. This shall be crushed in stages to pass through the 850-micron IS Sieve, which will constitute a laboratory sample.

6.4 Number of Tests — Where there are more than one laboratory samples representing a lot (*see* **6.2**), all these samples shall be subjected to chemical analysis individually for important chemical characteristics. For the remaining characteristics, a composite sample, prepared by mixing equal quantities of material from each of the laboratory samples representing a lot, shall be analyzed. The importance or otherwise of the various chemical characteristics of the primary nickel shall be specified by the purchaser for this purpose.

6.5 Reporting of Test Results

6.5.1 In those cases, where only one laboratory sample has been tested from each lot or where a composite sample has been tested, only one result will be available for each characteristic and that result shall be reported as the value of the characteristic for the lot sampled.

6.5.2 When only two laboratory samples have been analyzed individually from a lot, the average of the two available test results shall be reported as the value of the characteristic for the lot sampled. The individual test results shall also be reported to give an indication of the range of variation in quality.

6.5.3 When three or more laboratory samples have been analyzed individually from a lot, the following procedure shall be followed to assess the average quality and its limits of variation:

Let $x_1, x_2, x_3 \ldots\ldots\ldots\ldots, x_n$ be the results of analysis of 'n' laboratory samples for a particular characteristic.

Calculate

$$\text{Average } (\bar{x}) = \frac{(x_1 + x_2 + \ldots\ldots\ldots\ldots x_n)}{n}, \text{ and}$$

Range (R) = the difference between the maximum and the minimum values.

The average level of that characteristic in the lot shall be reported as equal to $\bar{x}$.

The limits of variation in the average level of that characteristic of nickel in the lot shall be reported as ($\bar{x} \pm hR$), where '*h*' is a factor, the value of which depends upon the number of laboratory samples analyzed. The appropriate value of the factor '*h*' shall be selected from Table 3.

TABLE 3 VALUES OF THE FACTOR '*h*'

Number of Laboratory Samples Analyzed	Value of the Factor '*h*'
3	1·36
4	0·72
5	0·51

6.6 Assessment of the Grade — Wherever three or more laboratory samples have been analyzed individually for assessing the grade of the nickel in the lot, the limits of variation as obtained under **6.5.3** shall be compared with the quality limits, specified for the grade in Table 1.

7. PACKING

7.1 The material shall be supplied packed in suitable containers in quantities mutually agreed to between the supplier and the purchaser.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Conversion*
Force	newton	N	1 N = 1 kg.1 m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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